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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/982,834	10/22/2001	Shigeru Sakuma	040808-5078-01	8481

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EXAMINER	
SONG, MATTHEW J	

ART.UNIT	PAPER NUMBER
1765	6

DATE MAILED: 10/23/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/982,834	Applicant(s) SAKUMA ET AL.	
	Examiner Matthew J Song	Art Unit 1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 July 2003* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,4,12-16 and 21-39* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4-10,12-16 and 21-39* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Objections

1. Claim 4 is objected to because of the following informalities: There is a typo in line 2. Claim 4 recites, "the temperature from **44said** second" in line 2. Appropriate correction is required.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-2, 4-8, 10, 12-16, 21 and 23-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oba et al (US 6,342,312) in view of Pandey (US 3,939,252) or Matsushita (US 4,193,783)..

Oba et al teaches an annealing furnace chamber, this reads on sealable container, **501**, a heater **503** and a crucible, this reads on second container, **504** for annealing a calcium fluoride crystal **505** (col 6, ln 1-15 and Fig 6). Oba et al also discloses a grown fluoride single crystal is annealing in the annealing furnace by heating the single crystal to 900 to 1000°C, this reads on a temperature below the melting point of calcium fluoride (col 6, ln 60-67). Oba et al also teaches a calcium fluoride single crystal is placed into a crucible in the annealing furnace with 0.1 wt% ZnF_2, this reads on fluorination agent, and the annealing furnace was heated from room temperature to 900°C and maintained for 20 hours and cooled to room temperature at a cooling rate of 6°C/min (Example 1).

Oba et al teaches annealing at 1000°C. Oba et al does not teaches annealing at 1020°C-1150°C. Annealing temperature and pressure are parameters commonly determined by routine experimentation. Hence, it would have been obvious to a person of ordinary skill in the art at the time of the invention to conduct routine experimentation to determine the optimum annealing temperature and pressure. The process of conducting routine optimization experiments of result effective variables is obvious to one of ordinary skill in the art (MPEP 2144.05). Furthermore, the selection of reaction parameters such as temperature and concentration is obvious (In re Aller 105 USPQ 233, 255 (CCPA 1955)).

Referring to claim 21, Oba et al is silent to the atmosphere of the annealing chamber. An inert atmosphere during an annealing process is well known in the art to prevent oxidation. It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Oba et al by filling the container with an inert gas to prevent introduction of impurities and oxidation during a high temperature anneal.

Oba et al does not teach the claimed cooling rate. However, the cooling rate following the annealing of a single crystal is well known in the art to be a result effective variable. Pandey or Matsushita is relied upon solely to teach the well-known fact in the art of single crystal manufacturing that cooling rates are result effective. Pandey teaches an optimal cooling rate over an annealing temperature range is determined by well-known criteria (col 2, ln 65-69) and the annealing cooling rate may be 0.5-5°C per hour and the theoretically ideal cooling rate would be just short of zero, but the cooling must be set at a practical rate and is a matter of economy (col 3, ln 1-35). Matsushita teaches heating a silicon crystal ingot in an inert atmosphere and cooling at rate smaller than 50°C/min because quenching a highly heated single crystal ingot tends to

cause slip lines and leads to the possibility of the ingot being broken (col 2, ln 45 to col 3, ln 5). Hence, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Oba et al to determine the optimal cooling rate over an annealing temperature by conducting routine experimentation of a result effective variable to maximize production while maintaining quality.

Referring to claims 5-8, 13-16 and 29-32, Oba et al does not teach the properties of single crystal calcium fluoride. However, since Oba et al teaches the claimed method, under the principle of inherency, the properties of the claimed product would be inherent to Oba et al.

4. Claims 9, 21, 22 and 33-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oba et al (US 6,342,312) in view of Pandey (US 3,939,252) or Matsushita (US 4,193,783) as applied to claims 1-8, 10-16, 20-21 and 23-32 above, and further in view of Favennec et al (US 5,319,653).

Oba et al teaches all of the limitations of claim 9, as discussed previously, except the second container is filled with fluorine gas.

In a method of forming an optical component, note entire reference, Favennec et al teaches a calcium fluoride powder is prepared from commercially available fluoride refluorinated in an atmosphere of fluorine immediately before it is used in order to eliminate any traces of oxides and water vapor that it might contain (col 3, ln 40-60). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Oba et al with Favennec et al's fluorine atmosphere to eliminate oxides and water vapor, which diminish the optical properties of a calcium fluoride, as taught by Oba et al (col 9, ln 25-35).

Referring to claim 22, the combination of Oba et al and Favennec et al teaches a single crystal of calcium fluoride and an atmosphere of fluorine, this reads on fluorination agent is vaporized. The combination of Oba et al and Favennec et al is silent to the pressure inside the first container. However, pressure is well known in the art to be a result effective variable determined by routine experimentation. Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Oba et al and Favennec et al by conducting routine experimentation to optimize the pressure of the first container. The process of conducting routine optimization experiments of result effective variables is obvious to one of ordinary skill in the art (MPEP 2144.05). Furthermore, the selection of reaction parameters such as temperature and concentration is obvious (In re Aller 105 USPQ 233, 255 (CCPA 1955)).

Referring to claim 33, Oba et al teaches shaping and additional treatment steps following the annealing step (col 7, ln 15-67 and Fig 2). The combination of Oba et al and Favennec et al is silent to opening the first container to a normal atmosphere. It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Oba et al and Favennec et al by opening the container to a normal atmosphere to retrieve the calcium fluoride crystal for further processing, as taught by Oba et al.

Referring to claims 36-39, the combination of Oba et al and Favennec et al does not teach the properties of single crystal calcium fluoride. However, since the combination of Oba et al and Favennec et al teaches the claimed method, under the principle of inherency, the properties of the claimed product would be inherent to the combination of Oba et al and Favennec et al.

Response to Arguments

5. Applicant's arguments filed 7/28/2003 have been fully considered but they are not persuasive.

Applicant's argument that the combination of Oba and Matsushita does not disclose the claimed cooling rate is noted but is not found persuasive. Applicant alleges that cooling rate taught by Oba and Matsushita is much higher than the claimed rate. However, the rejection is based on the general principle that the cooling rate of a crystal, which is annealed at a high temperature, is a result effective variable, as taught by Matsushita. The cooling rate can be optimized through routine experimentation to obtain the claimed cooling rate. The claimed cooling rate is not taught by Oba or Matsushita, but it would have been obvious to one of ordinary skill in the art. The selection of reaction parameters such as temperature and concentration is obvious (In re Aller 105 USPQ 233, 255 (CCPA 1955)). It is also noted that the rate taught by Matsushita is 50°C/min or smaller, which overlaps the claimed range.

Applicant's argument that the combination of Oba and Pandey does not teach the claimed cooling rate is noted but is not found persuasive. Applicant alleges that cooling rate taught by Oba and Pandey is much higher than the claimed rate. However, the rejection is based on the general principle that the cooling rate of a crystal, which is annealed at a high temperature, is a result effective variable, as taught by Pandey. The cooling rate can be optimized through routine experimentation to obtain the claimed cooling rate. The claimed cooling rate is not taught by Oba or Matsushita, but it would have been obvious to one of ordinary skill in the art. The selection of reaction parameters such as temperature and concentration is obvious (In re Aller 105 USPQ 233, 255 (CCPA 1955)).

The teaching of Pandey and Matsushita are relied upon solely as a general teaching of the well known principle that cooling rate after annealing a crystalline material at a high temperature is a result effective variable. The principle of cooling rate is a result effective variable is further taught by Atherton et al (US 5,099,490) below, which teaches defects migrate to grain boundary if the cooling rate is slow enough. Optimization of result effective variables is held to be obvious (MPEP 2144.05).

Furthermore, Applicant alleges the claimed cooling rate of 2°C/hr is not obvious to one of ordinary skill in the art. However, Applicant's admitted prior art teaching on page 6, lines 9-12 teaches a slow cooling rate of 5-10°C/hour is a known cooling rate for calcium fluoride crystals.

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Chen et al (US 4,902,376) teaches a two step cooling process, where crystallized GaAs is annealed at 1100-1220°C, then cooling the annealed GaAs firstly to 800°C at a cooling rate of 10-30°C per hour and finally to room temperature at a rate of about 80°C per hour (col 4, ln 15-45).

Bao et al (US 3,746,352) teaches a calcium fluoride powder and nickel oxide powder are sintered at 2500-3000°F in an inert atmosphere and an inert atmosphere prevents any formation of calcium oxide (col 2, ln 40-55).

Cho et al (US 5,494,850) teaches a calcium fluoride film whose optical characteristics are improved when annealing in hydrogen or mixture of hydrogen with nitrogen, helium argon or any other inert gas (col 4, ln 50-67).

Atherton et al (US 5,099,490) teaches as crystalline material is cooled from high temperature, the equilibrium point defect concentration characteristic of that temperature must be reduced to that of the end point temperature. Providing the cooling rate is slow enough, the point defects can migrate to dislocation, grain boundary or surface sinks. If a high rate of cooling is used, the individual point defects are quenched into the lattice, giving a high elastic strain (col 2, ln 20-35). Atherton et al also discloses laser crystal comprising a fluoride crystal (col 1, ln 20-68).

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J Song whose telephone number is 703-305-4953. The examiner can normally be reached on M-F 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 703-305-2667. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Matthew J Song
Examiner
Art Unit 1765

MJS

NADINE G. NORTON
PRIMARY EXAMINER